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(54) Title: BIDIRECTIONAL FLOW CENTRIFUGAL MICROFLUIDIC DEVICES

(57) Abstract: This invention relates to methods and apparatus for performing microanalytic and microsynthetic analyses and procedures. The invention particularly provides microsystem platforms for achieving efficient mixing of one or a plurality of fluids on the surface of the platform when fluid flow is motivated by centripetal force produce by rotation.

BIDIRECTIONAL FLOW CENTRIFUGAL MICROFLUIDIC DEVICES

This application claims priority to U.S. Provisional Application, Serial No. 60/204,264, filed May 15, 2000., the disclosure of which is explicitly incorporated by reference herein.

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to chemical and biological assay technology carried out in disposable plastic assemblies, and in particular the devices referred to as microfluidic systems as disclosed in U.S. Patent No. 6,063,589, issued May 16, 2000, and co-owned and co-pending patent applications U.S. Serial Nos. 08/761,063, filed December 5, 1996; 08/768,990, filed December 18, 1996; 08/910,726, filed August 12, 1997; 08/995,056, filed December 19, 1997; and 09/315,114, filed May 19, 1999, the disclosures of each of which are explicitly incorporated by reference herein.

Background of the Related Art

Microfluidic systems are closed interconnected networks/systems of channels and reservoirs with characteristic dimensions ranging from microns to millimeters. By introducing fluids, reagents and samples into the devices, chemical and biological assays can be carried out in an integrated and automated way. In a conventional assay, two or more fluids are mixed and incubated within a microfluidic device and during, or after, this incubation period, a reaction product may be detected. It is typically the case that this microfluidic device, specifically the depths, cross-sectional dimensions and connectivity and layout of the microfluidic systems, defines the relative volumes of these fluids.

A problem in the art is that microfluidic devices, once fabricated, do not allow the user to redefine the relative volumes of the fluids to be mixed. An additional problem in the art concerns the degree and efficiency of mixing. Because the flow within a microfluidic device is laminar, mixing is brought about through mass diffusion. A typical mixing device consists of a long capillary. Two or more fluids may enter this capillary as separate fluids and leave as a single fluid. The